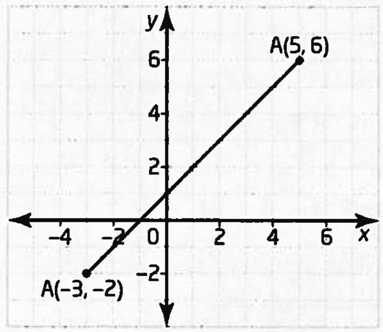
Chapter 2 Review

2.1 Midpoint of a Line Segment, pages 56–69

1. Find the midpoint of each line segment.

a)



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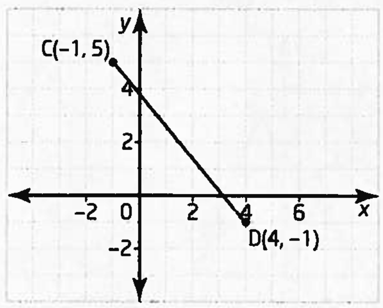

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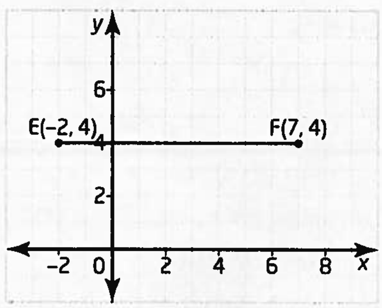

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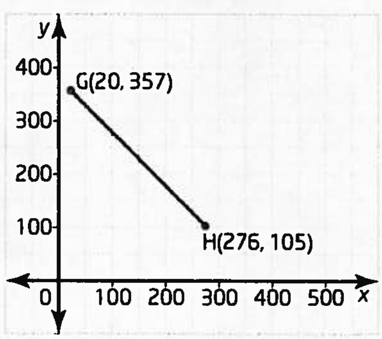


2. a) Determine the midpoint of the line segment with endpoints J(3, −5) and K(−5, −6).

b) Determine the midpoint of the line segment with endpoints L(4, 8) and N(4, −2).

3. a) Draw the triangle with vertices P(−2, 5), Q(6, 5), and R(2, −7).

b) Determine the midpoint of each side of the triangle algebraically.

c) Join the midpoints to form a smaller triangle. Compare this triangle to the original triangle.

4. a) Draw the triangle with vertices T(−8, 6), U(2, 10), and V(4, −4).

b) Draw the median from vertex U. Then, find an equation for this median.

c) Draw the altitude from vertex T. Then, find an equation for this altitude.

d) Draw the right bisector of TU. Then, find an equation for this right bisector.

5. The midpoints of the sides of △ABC ar D(4, 1), E(−2, 3), and F(1, −4).

a) Plot the midpoints. Use this plot to estimate the coordinates of the vertices of △ABC.

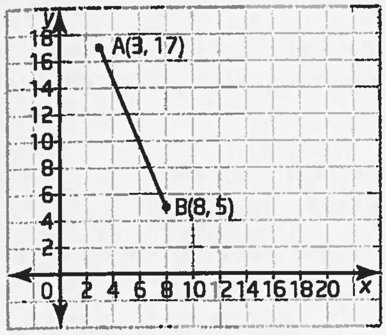
b) Use analytic geometry to calculate the coordinates of the vertices of △ABC.

c) Describe how to use geometry software to find the coordinates of the vertices.

2.2 Length of a Line Segment, pages 70–79

6. Find the length of each line segment.

a)



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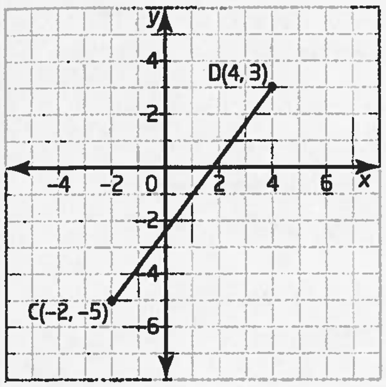

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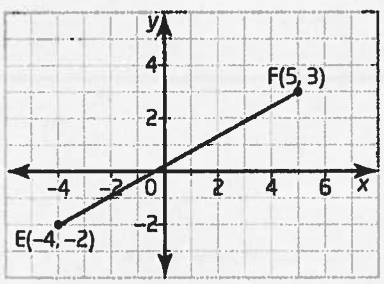

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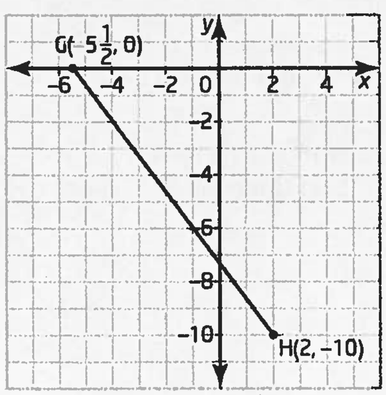


7. Determine the length of the line segment defined by each pair of points.

a) J(4, 8) and K(4, −2)

b) M(−3, −12) and N(−15, −7)

c) P(−3, −2) and Q(5, 6)

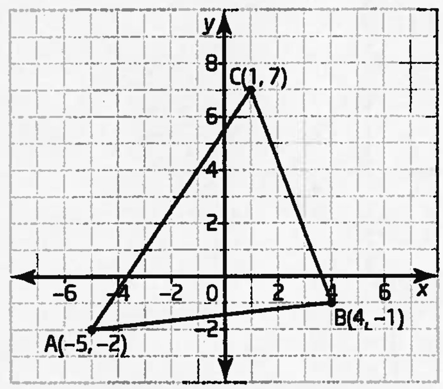
d) R(−1, 5) and S(4, −1)

e) T(−2, 4) and U(7, 4)

f) V(3, −5) and W(−5, −6)

8. a) Determine the length of the median from vertex A of △ABC.

b) Determine the perimeter of the triangle.



9. a) Draw the triangle with vertices D(5, 25), E(210, 1), and F(3, 210).

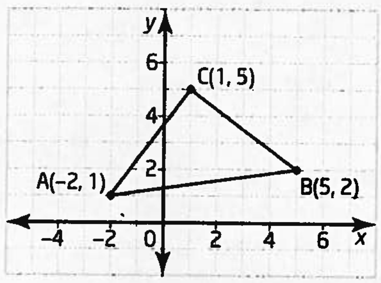
b) Use analytic geometry to classify △DEF.

c) Determine the area of △DEF.

d) Describe how to use geometry software to answer part c).

2.3 Apply Slope, Midpoint, and Length Formulas, pages 80–91

10. Show that this triangle is isosceles.



11. A triangle has vertices D(−2, 7), E(−4, 2), and F(6, −2).

a) Show algebraically that this triangle is a right triangle.

b) Find the midpoint of the hypotenuse.

c) Show that this midpoint is equidistant from each of the vertices.

12. A map shows a main gas pipeline running straight from A(45, 60) to B(65, 40).

a) How long is the section of pipeline from A to B if each unit on the map grid represents 1 km?

b) A branch pipeline runs perpendicular to the main pipeline and meets it at a point halfway between A and B. Find the coordinates of this point.

c) Is the point C(63, 54) on the branch pipeline? Explain your reasoning.

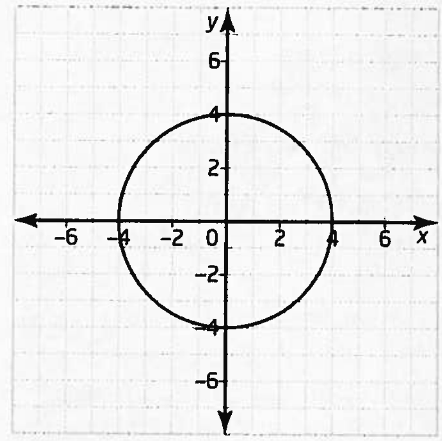
d) What is the shortest route for connecting point C to the main pipeline? Explain.

13. Find the shortest distance from the origin to the line defined by $y = 3x - 10$.

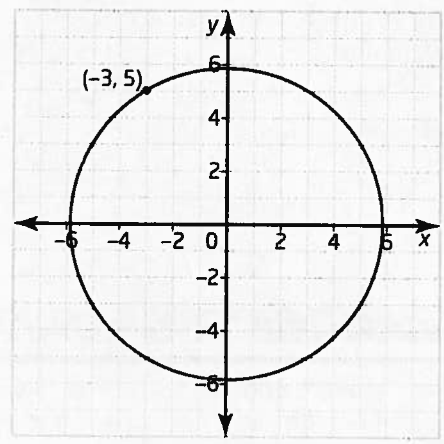
2.4 Equation for a Circle, pages 92–99

14. Determine an equation for each circle.

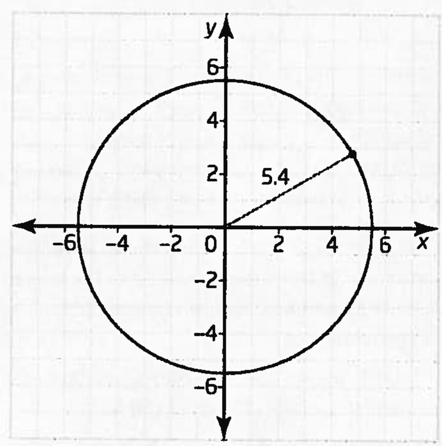
a)



b)



c)



15. Find an equation for the circle that is centred on the origin and

a) has a radius of $4\frac{1}{2}$

b) has a diameter of 14

c) has a radius of $\sqrt{12}$

d) passes through the point (4, 7)

16. a) Determine whether the point $A(-2, -6)$ lies on the circle defined by $x^2 + y^2 = 40$.

b) Find an equation for the radius from the origin O to point A.

c) Find an equation for the line that passes through A and is perpendicular to OA.

d) Use a graph to check your answers to parts a), b), and c).

e) Explain why A is the only point on the line that also lies on the circle.

17. a) Show that the line segment joining $A(-3, 1)$ and $B(1, 3)$ is a chord of the circle defined by $x^2 + y^2 = 10$.

b) Determine an equation for the right bisector of the chord AB.

c) Show that the line in part b) passes through the centre of the circle.

18. A communication tower can send and receive signals from cell phones up to 20 km away. A cell phone user is 15 km east and 13 km south of the tower. Is this user able to receive a signal from the tower?

Chapter Problem Wrap-Up

Many natural systems, such as river deltas and tree branches, have patterns that look like fractals. Parts within a natural pattern usually vary somewhat, so they are not exactly similar. Nonetheless, fractals often provided the first reasonably accurate mathematical model for such complex systems.

Beginning with a discovery by the meteorologist Edward Lorentz in 1961, scientists and mathematicians found that fractal models revealed surprising patterns in data that had appeared to be completely random. The mathematics that describes this hidden order in complex systems is called chaos theory. Applications of chaos theory include models of ocean currents, population growth, commodity prices, and blood flow in veins and arteries.

a) Research fractals at a library or on the Internet. Describe how to create a fractal different from the ones mentioned in this chapter. Choose a fractal you learned about during your research or create one of your own. Explain how midpoints, lengths, or equations for circles are used to generate the fractal.

b) Make a poster of the fractal you described in part a). Draw the fractal by hand or by using technology. Describe any special features of the fractal.

c) Describe a specific application of fractals, such as a scientific model or computer-generated imaging (CGI).